ATTACHMENT 9

WATER QUALITY PROTECTION MANAGEMENT MEASURES FOR GRAZINGLAND

Water Protection Management Measures[1] for Grazinglands

Managing grazinglands for water quality protection has proven to be much more involved than previous management concepts would indicate. Research, experience, and management strategies in place in the United States and Canada have shown that the traditional interpretation of basic management principles and practices (Table 1) are not adequate to meet water quality standards imposed on most watersheds. Of particular concern is the traditional approach to grazing distribution. Grazing distribution has been defined as the pattern created by livestock grazing an area of rangeland or pasture. Under traditional interpretations, certain areas in a pasture were considered to be "normally overgrazed" which included lowland areas, a key concern in water quality. To meet water quality protection management measure criteria, these areas need to have an adequate vegetative cover similar to upland areas.

A key concept to understanding grazinglands and water quality is the potential for pollutants to enter flowing water relies on two sources: runoff and direct deposition by animals. In addition, it should be understood that a natural level of sediments, nutrients, and bacteria will enter flowing water. Quantifying the natural level is not possible since it varies with the characteristics of the precipitation event and the landscape. Modifying the landscape features is the most feasible approach and can best be done by understanding animal behavior and the factors that influence the their behavior.

Four major factors influence animal behavior in a pasture: livestock water (location, kind), shade (location), prevailing wind direction, and topography. Since the latter two are natural factors and can't be readily modified, the first two are the ones that can be changed.

Managing animal behavior must now raise the conceptual level of traditional grazing distribution concepts. In effect, creating the equivalent of a pasture wide "buffer" type vegetative cover that can slow or reduce runoff and reduce the time animals spend in lowland areas is the goal. The major landscape features that are important in understanding animal behavior are areas such as where animals concentrate, trailing areas, differences in grazing intensity, and loafing areas (Table 2). Combining this information with the four major factors will begin the process of understanding why the animals have created the variations in the pasture. Once these relationships are understood, management strategies to change animal behavior can be developed and evaluated. Evaluations must consider such things as the ability of the operator to manage the new strategies, economic profitability, and long term viability of the strategy.

The following tables list various levels of Water Protection Management Measures developed as a guide for improving grazingland water quality in Kansas. The tables are:

Table 1. Management Measure Components for Improving Grazing Land Water Quality

Table 2: Grazing Land Water Quality Concerns and Associated Pollutants.

Table 3. USDA-NRCS Conservation Practices Applicable to Kansas Grazing Land and Pollutants Potentially Controlled

Variations in practice(s) selected by a grazing manager will depend not only on topography, productivity, and vegetative type of the grazing resources; it will also depend upon management resources such as livestock, fences, water, time and management ability.

Costs of structural/improvement practices (end of Table 1) vary with local conditions. Examples include well installation, pipeline construction, and cross-fences. Well installation varies according to depth to water and availability of power source (electricity, solar). Pipeline construction and cross fences costs vary with kind, length, and topography (presence of rock and similar layers).

[1] According to EPA (2000) a management measure is a group of affordable management practices that are used together in a system to achieve more comprehensive goals such as sustained water quality improvement. Management measures in this context must include managerial practices and may require a structural practice component.

Table 1. Management Measure[2] Components for Improving Grazing Land Water Quality

Managerial principle/practices

Maintaining vegetative cover consistent with maintaining high forage production and reducing concentrated animal use in or near streams are important objectives for improving water quality on grazing lands. Common grazing management principles used to manage forage production are described in the following table in the context of water quality protection and enhancement.

Grazing Management Principle/Practice	Description of Principle/Practice	Applying Principle/Practice in Management Measures	Expected Benefits (grazing resource and/or water quality benefits)
Stocking rate	Stocking rate is defined as the number of animals on a given amount of land area for specified amount of time. Determining rate involves fitting long term animal dry matter needs to forage currently available for harvest. Variables: forage available, physiological needs of the kind and class of the animals, season of use (majority of growing season, part of growing season, non-growing season)	Establish and adjust as necessary to achieve and sustain vegetative cover that mitigates potential NPS pollution associated with runoff.	1) improve forage production for desired species. 2) improve vegetative cover thus reducing the potential for pollutants to reach water resources. 3) reduce the influence of sacrifice or concentration areas.
Grazing distribution	Managing animal movement and selective grazing behavior to create a mosaic of vegetative cover that is uniform over the pasture. A number of management practices are used to improve distribution.	Manage to improve forage quality and vegetative cover. Avoid livestock loafing in or adjacent to water resources such as streams. Also avoid overgrazing and concentrated use in any areas where surface runoff can easily carry pollutants to water resources.	1) reduce runoff influences of patchy grazing by widely distributing smaller patches (surrounded by good vegetative cover) throughout the pasture. 2) improve both present year and long-term forage quality. 3) improve vegetative cover, and reduce potential for pollutants to reach water resources.
Season of use	The balance between the growth process of the grazing resources and physiological requirements of the animals should be a consideration when determining the season in which a pasture is used. Management decisions, economic shifts, changing forage, and climatic events can create the need to change season of use. Depending upon the grazing and management resources available, managers can strategically alternate the season of forage use as a systematic means of providing periodic rest for maintaining forage cover and vigor.	Typically grazing use is concentrated on introduced cool season forages during the spring and fall, on native warm season grasses during the summer, on crop residues during the fall, and wintering on deferred pastures. The relative value of forages will vary depending upon the kind and class of livestock and growing conditions. Changing or alternating time of year (majority of growing season, part of growing season, non-growing season) grazing resources are used can improve	1) improve vegetative cover in sensitive areas. 2) reclaim exposed soil. 3) provide additional rest to unusually stressed forage plants. The potential value of changing or alternating season of use to benefit water quality is highly dependant upon the unique characteristics of the manger's grazing and management resources.

Grazing Management Principle/Practice	Description of Principle/Practice	Applying Principle/Practice in Management Measures	Expected Benefits (grazing resource and/or water quality benefits)
Kind and class of animals	Grazing preference for forage (grass, forbs, browse, residue) varies with forage growth stage and animal species/physiology (cattle, sheep etc./yearling, pregnant, lactating etc.). Animal size changes dry matter and nutrient requirements.	Needed adjustments in stocking rate, grazing distribution, and season of use should be evaluated in response to past and future changes in the kind, class, and size of the animals being stocked.	Combination of above.
Periodic and systemic rest	Grazing systems that provide a regular pasture use/rest sequence should increase forage vigor, and animal performance. Use and/or design of such systems is highly dependant upon grazing and management resources.	Incorporating potential water quality concerns into planned grazing systems.	Combination of above.

High Priority Technical Practices (to be used with grazing principles above)			
Fertility management (Nitrogen, Phosphorus, pH, etc.)	Coordinating the time and amount of fertilizer application plus balancing nutrient inputs to meet forage needs. Soil testing and nutrient budgeting (matching inputs to expected production) are key considerations.	Soil testing, nutrient budgeting, timely application.	Reduce the potential to create excess nutrients that are available for transport to water resources.
Integrated brush and weed management	Using an appropriate combination of biological, mechanical, cultural and chemical methods to cost-effectively control problem species.	The most cost effective and timely methods appropriate for the situation should receive priority. Considerations include location, species to be protected and controlled, plant growth stages and infestation level. **Follow current label cautions, instructions and directions when using pesticides.**	Helps prevent erosion, promote uniform forage utilization and avoid over grazing which could result from a gradual decline in range condition. Selecting methods appropriate for the situation and following current pesticide label information helps to minimize pollution risks.

Structural/improvement practices

Landowners and operators will need to adjust how they apply grazing management principles to their own unique grazing resources to benefit water quality. This adjustment may require the application of a unique combination of management and structural/improvement practices. Variations in practice(s) selected by a grazing manager will depend not only on topography, productivity, and vegetative type of the grazing resources; it will also depend upon management resources such as livestock, fences, water, time and management ability. The following is a partial list of structural/improvement practices to be used with grazing management principles to implement management measures for water quality.

DRAFT. Office of Water, Nonpoint Source Control Branch, U.S. Environmental Protection Agency, Washington, D.C.

Table 2: Grazing Land Water Quality Concerns and Associated Pollutants.

POTENTIAL CONCERN	POTENTIAL POLLUTANT			
	Phosphorus Compounds	Nitrogen Compounds	Sediment	Fecal Coliform
Poor Grazing Distribution	**		**	
Overgrazing	**	**	**	**
Access Roads			**	
Animal Trails and Walkways	**		**	**
Invasive Woody Species			**	
Stream Channelization	**	**	**	
Poorly located and abandoned fences	**	**	**	
Concentration Areas	**	**	**	**
Watering Point Location	**	**	**	**

Table 3. USDA-NRCS Conservation Practices Applicable to Kansas Grazing Land and Pollutants Potentially Controlled

NRCS CODE	PRACTICE	POLLUTANT TO BE CONTROLLED											
		TP	PP	OP	TN	TKN	ON	NI	AM	SE	BOD	COD	FC
Managerial Practices:													
528A	Prescribed Grazing		**							**			
352	Deferred Grazing		**	**	**	**		**	**	**			**
Structural Practices:													
560	Access Road									**			
575	Animal Trails and Walkways		**						**	**			**
314	Brush Management									**			
322	Channel Vegetation	**	**	**		**		**	**	**			
382	Fencing	**	**	**	**	**	**		**	**			
410	Grade Stabilization Structure		**							**			
548	Grazing Land Mechanical Treatment	**			**	**		**		**			
561	Heavy Use Area Protection	**			**					**			**
472	Livestock Exclusion	**	**	**	**	**	**		**	**			**
512	Pasture and Hay Planting	**	**		**				**	**			**
378	Pond	**	**		**	**	**	**		**			
550	Range Planting									**			
614	Trough or Tank									**			
638	Water and Sediment Control Basin	**	**	**	**	**	**	**		**			

Pollutants:

TP = Total Phosphorus
PP = Particulate Phosphorus
OP = Orthophosphate
TN = Total Nitrogen
TKN = Kjeldahl Nitrogen
ON = Organic Nitrogen
NI = Nitrate
AM = Ammonia
SE = Sediment
BOD= Biological Oxygen Demand
COD = Chemical Oxygen Demand
FC = Fecal Coliform

Adapted from: USDA-NRCS 1977. National Handbook of Conservation Practices. Natural Resource Conservation Service, U.S. Department of Agriculture, Washington, D.C. (Cited in: EPA 2000. National Management Measures to Control Nonpoint Source Pollution from Agriculture: DRAFT. Office of Water, Nonpoint Source Control Branch, U.S. Environmental Protection Agency, Washington, D.C.)

Note: For detailed description of listed practices, consult the following URL: http://www.ncg.nrcs.usda.gov/nhcp_2.html